Stream Restoration or Stormwater Management: Setting Priorities in Urban Watersheds

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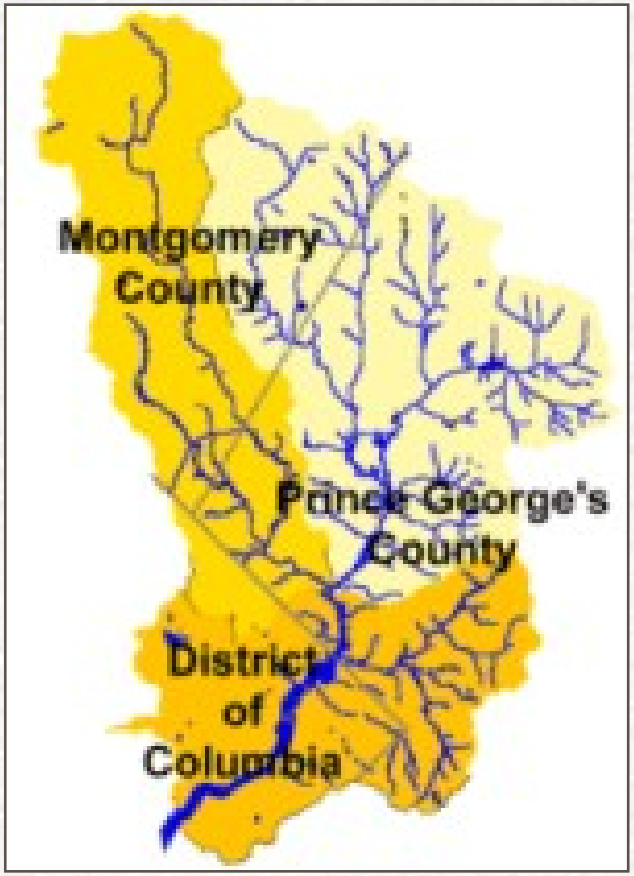
Urban Watershed Restoration Process

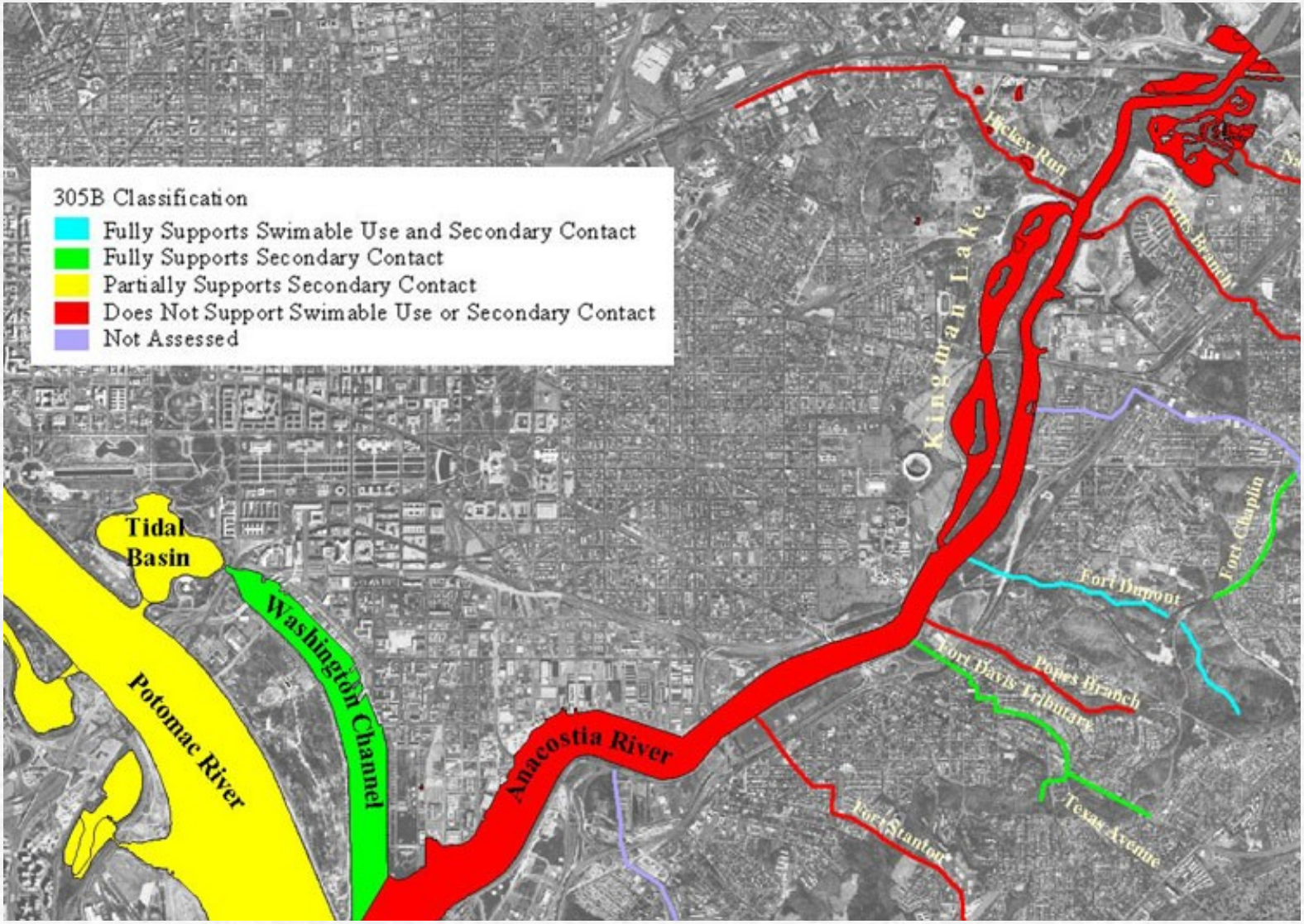
- Stormwater retrofitting
- Pollution prevention
- Stream habitat restoration

Anacostia Watershed

- Covers 176 square miles
- 15% of watershed within District of Columbia
- Upper reaches in MD are free-flowing streams
- Tidal portion is 8.4 miles



Anacostia Estuary, Late 1800’s



The Anacostia is one of three most polluted rivers in the Chesapeake Bay

On-going Planning Efforts

Regional

- **Chesapeake Bay 2000**
- **1999 Anacostia Watershed Restoration Agreement**
- **Anacostia River Toxics Management Action Plan (TMAP)**
- **Clean Water Action Plan**
- **Subwatershed Restoration Action Strategies**

Local

- **CSO Policy**
- **CWA requirements for 303(d) list and TMDL development**
- **DC Tributary Nutrient Reduction Strategy**
- **MS4 permit requirements**
- **Nonpoint Source Management Plan II**
- **NPDES permit requirements**

1999 Anacostia Watershed Restoration Agreement

- Goal #1: Dramatically reduce pollutant loads
- Goal #2: Protect and restore the ecological integrity
- Goal #3: Restore the natural range of resident and anadromous fish to historical limits
- Goal #4:Increase the natural filtering capacity and habitat diversity of the watershed
- Goal #5:Protect and expand forest cover
- Goal #6 Increase citizen and private

2001 Anacostia Watershed Restoration Agreement

- Reaffirm commitment to 1999 goals
- Developed 50 indicators to determine progress of restoration
- Set measurable goals to be achieved by 2010

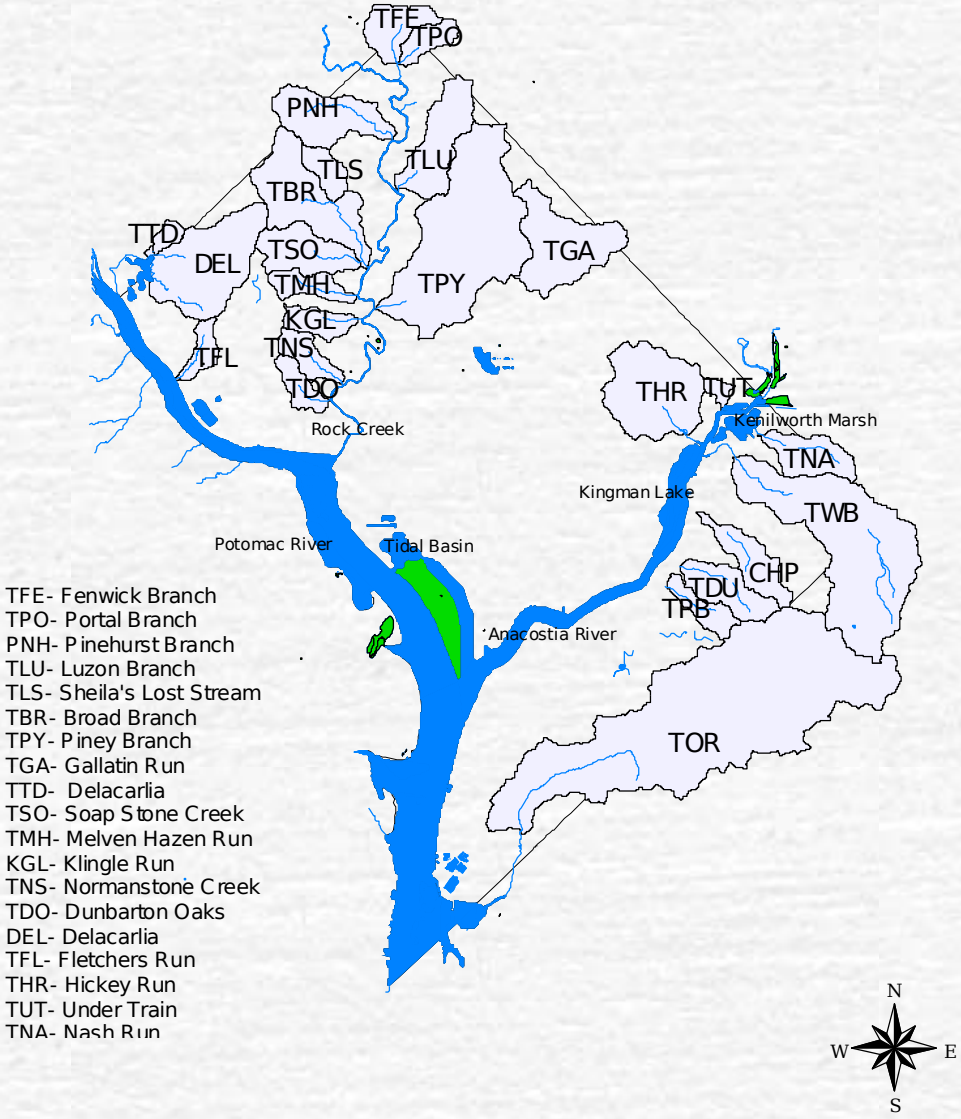
Anacostia Restoration Sites

- Mainstream Anacostia
  - Kingman Lake
  - River Fringe Wetlands
  - Kingman Island
  - RFK BMP
  - Lower Anacostia Park
- Tributaries
  - Watts Branch
  - Hickey Run
  - Fort Dupont
  - Fort Chaplin
  - Pope Branch

Prioritization of Subwatersheds

- Can subwatershed be restored?
- Stream valley parks present?
- Available public land?
- Prior biological data available?
- Subwatershed have moderate impervious cover (less than 60%)?
- Can past stormwater management options be altered?

Subwatersheds of Rock Creek and the Anacostia River, District of Columbia

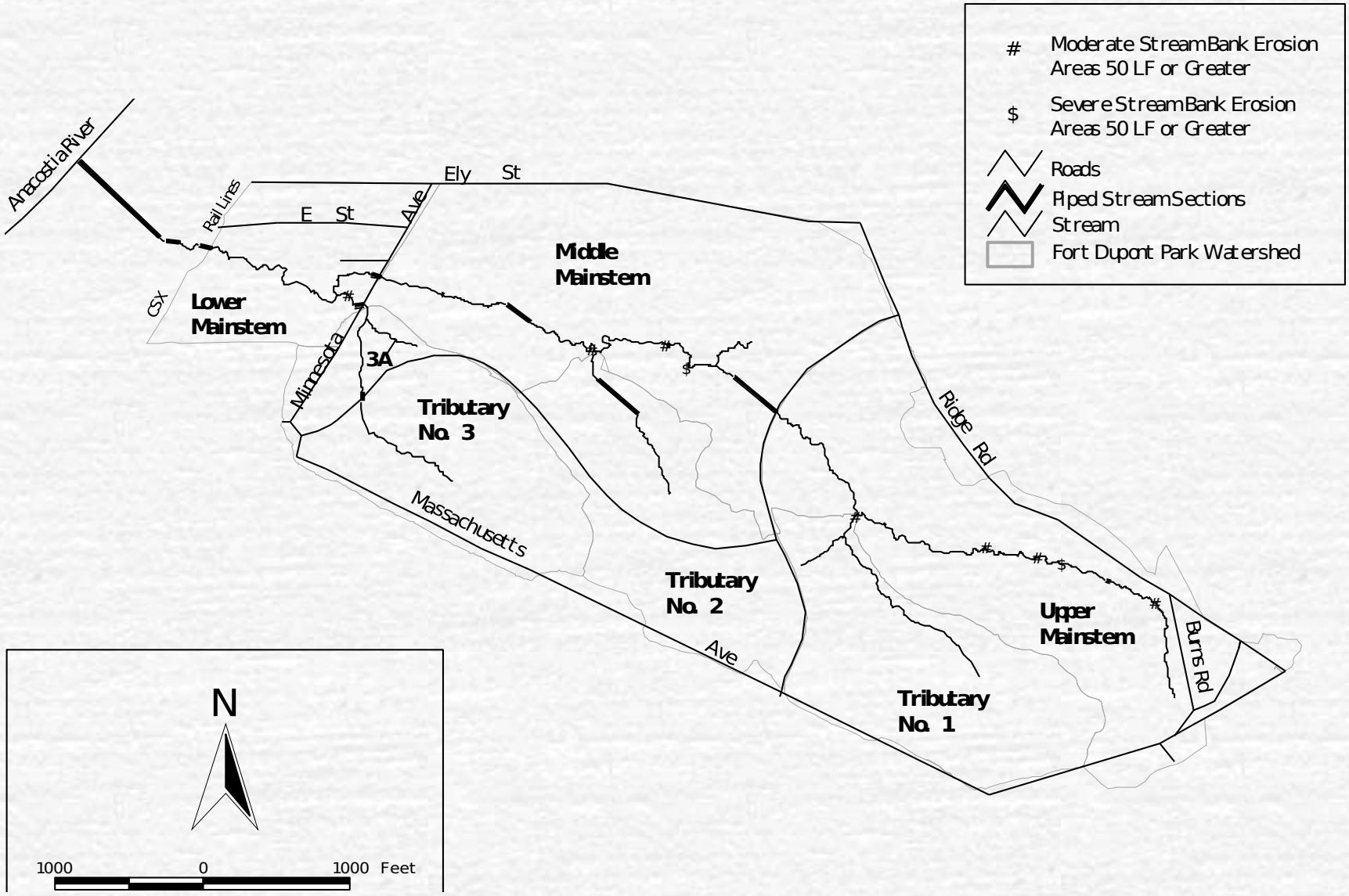


TFE- Fenwick Branch
TPO- Portal Branch
PNH- Pinehurst Branch
TLU- Luzon Branch
TLS- Sheila's Lost Stream
TBR- Broad Branch
TPY- Piney Branch
TGA- Gallatin Run
TTD- Delacarlia
TSO- Soap Stone Creek
TMH- Melven Hazen Run
KGL- Klingle Run
TNS- Normanstone Creek
TDO- Dunbarton Oaks
DEL- Delacarlia
TFL- Fletchers Run
THR- Hickey Run
TUT- Under Train
TNA- Nash Run

Urban Watershed Restoration Process

- Stormwater retrofitting
- Pollution prevention
- Stream restoration

- Streams Considered
  - Fort Chaplin
  - Hickey Run
  - Fort Dupont
  - Pope Branch
  - Watts Branch


Anacostia River
Rail Lines
Ely St
E St
Ave
CSX
Lower Mainstem
Middle Mainstem
Minnesota
3A
Tributary No. 3
Massachusetts
Ave
Tributary No. 2
Tributary No. 1
Ridge Rd
Upper Mainstem
Burns Rd
Moderate Stream Bank Erosion Areas 50 LF or Greater
$ Severe Stream Bank Erosion Areas 50 LF or Greater
Roads
Piped Stream Sections
Stream
Fort Dupont Park Watershed
N
1000 0 1000 Feet

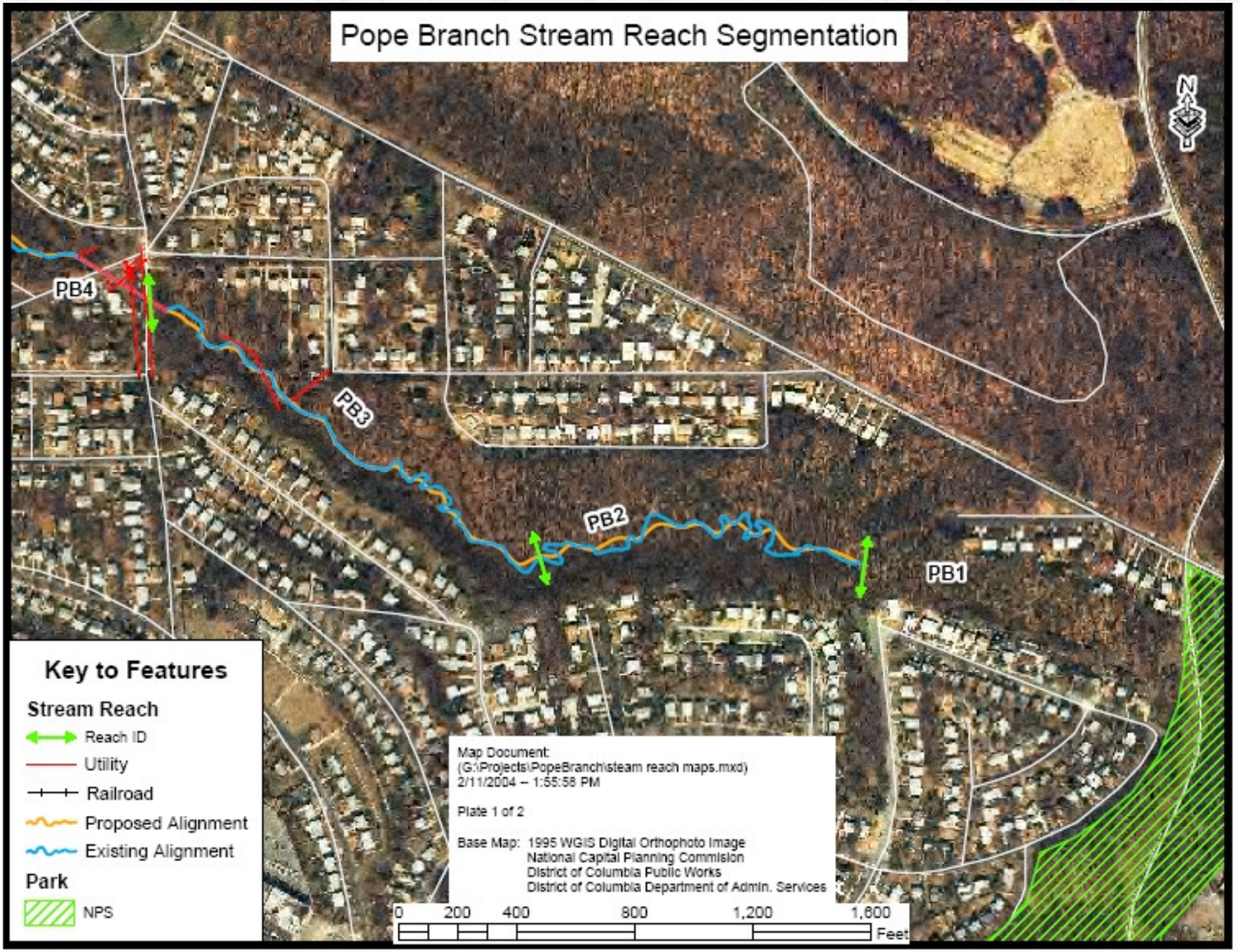

Pope Branch Stream Reach Segmentation
N
PB4
PB3
PB2
PB1
Key to Features
Stream Reach
Reach ID
Utility
Railroad
Proposed Alignment
Existing Alignment
Park
NPS
Map Document:
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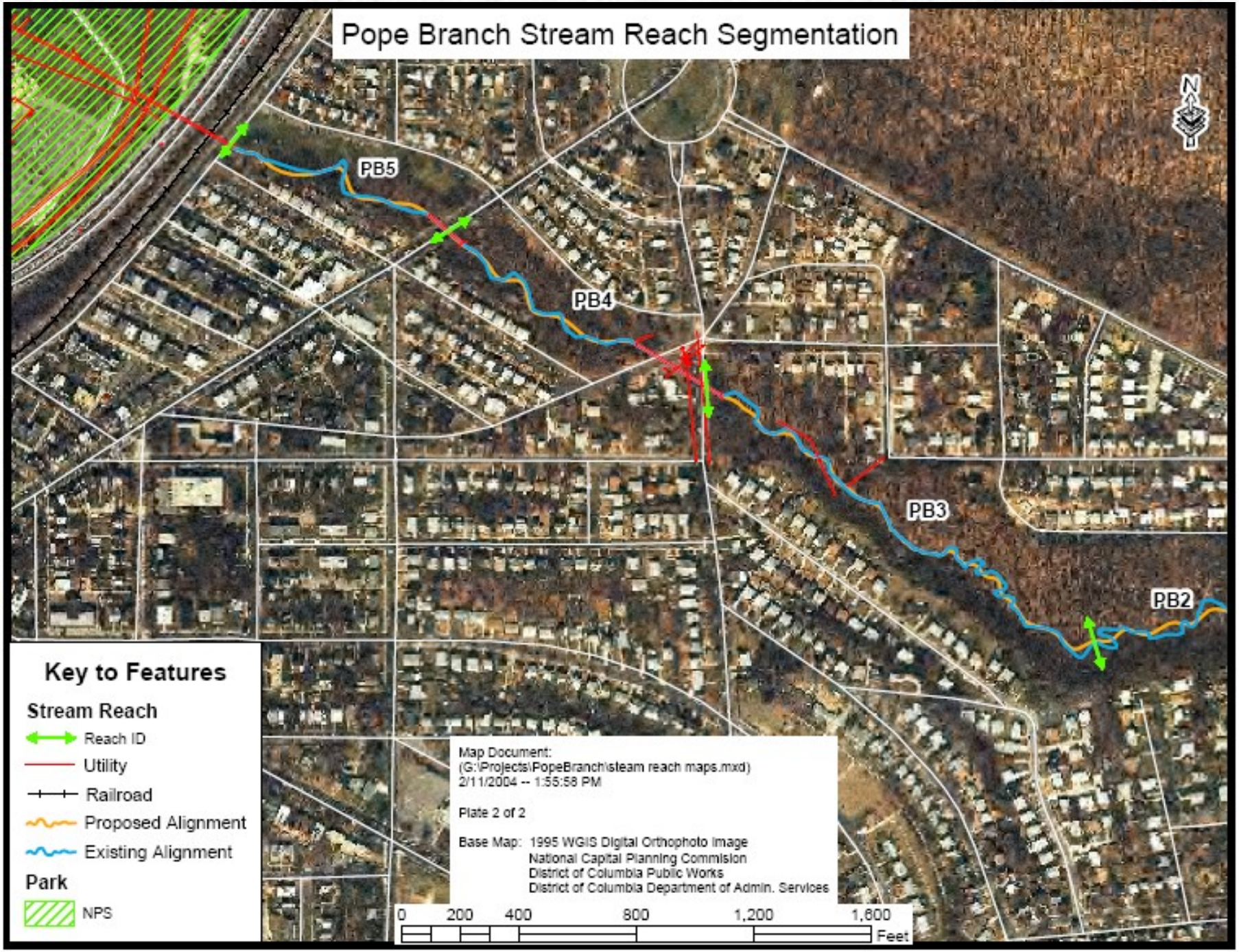
Plate 1 of 2
Base Map: 1995 WGIS Digital Orthophoto Image
National Capital Planning Commision
District of Columbia Public Works
District of Columbia Department of Admin. Services
0 200 400 800 1,200 1,600
Feet


Pope Branch Stream Reach Segmentation
PB5
PB4
PB3
PB2
N
Key to Features
Stream Reach
Reach ID
Utility
Railroad
Proposed Alignment
Existing Alignment
Park
NPS
Map Document:
(G:\Projects\PopeBranch\steam reach maps.mxd)
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National Capital Planning Commision
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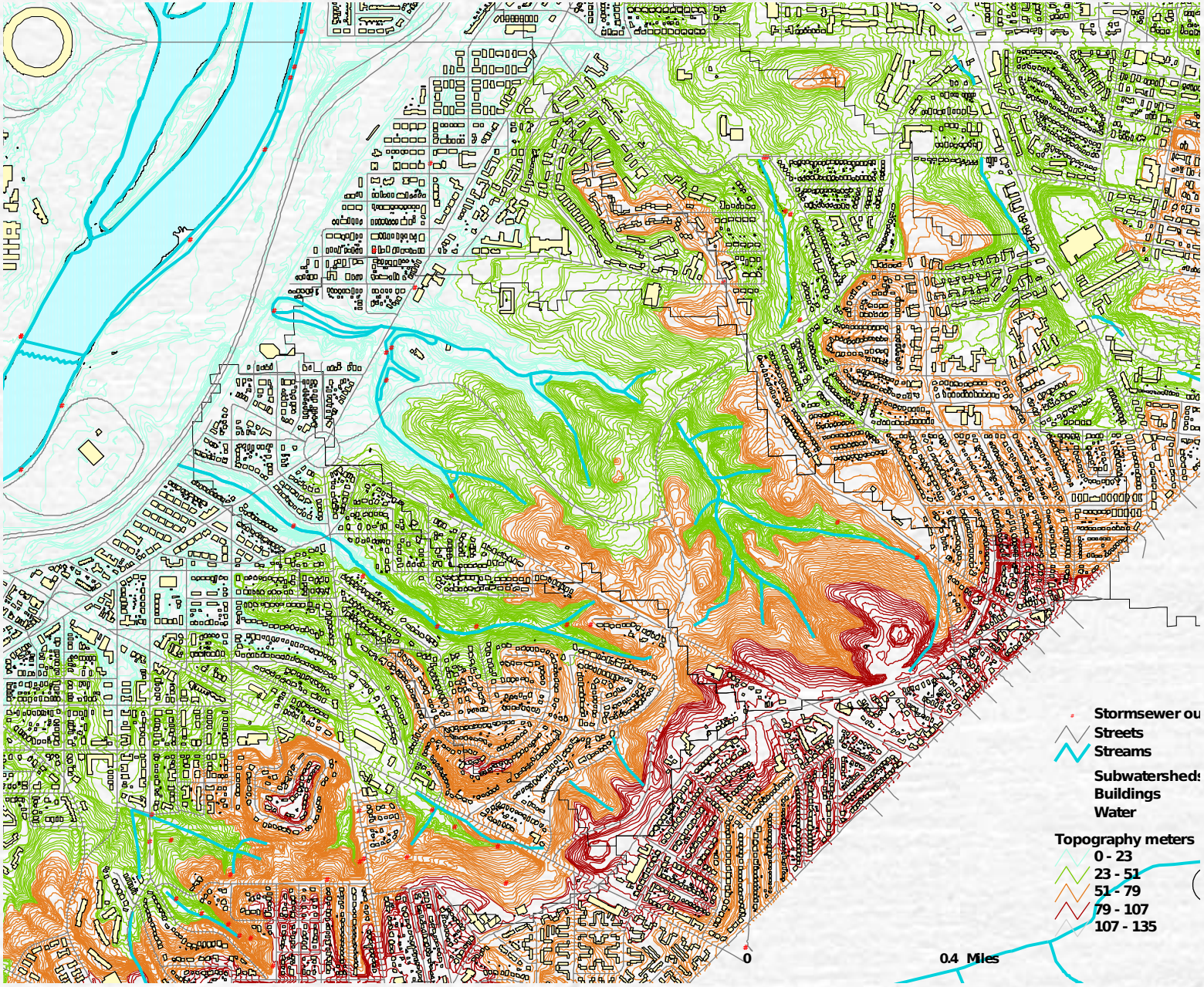
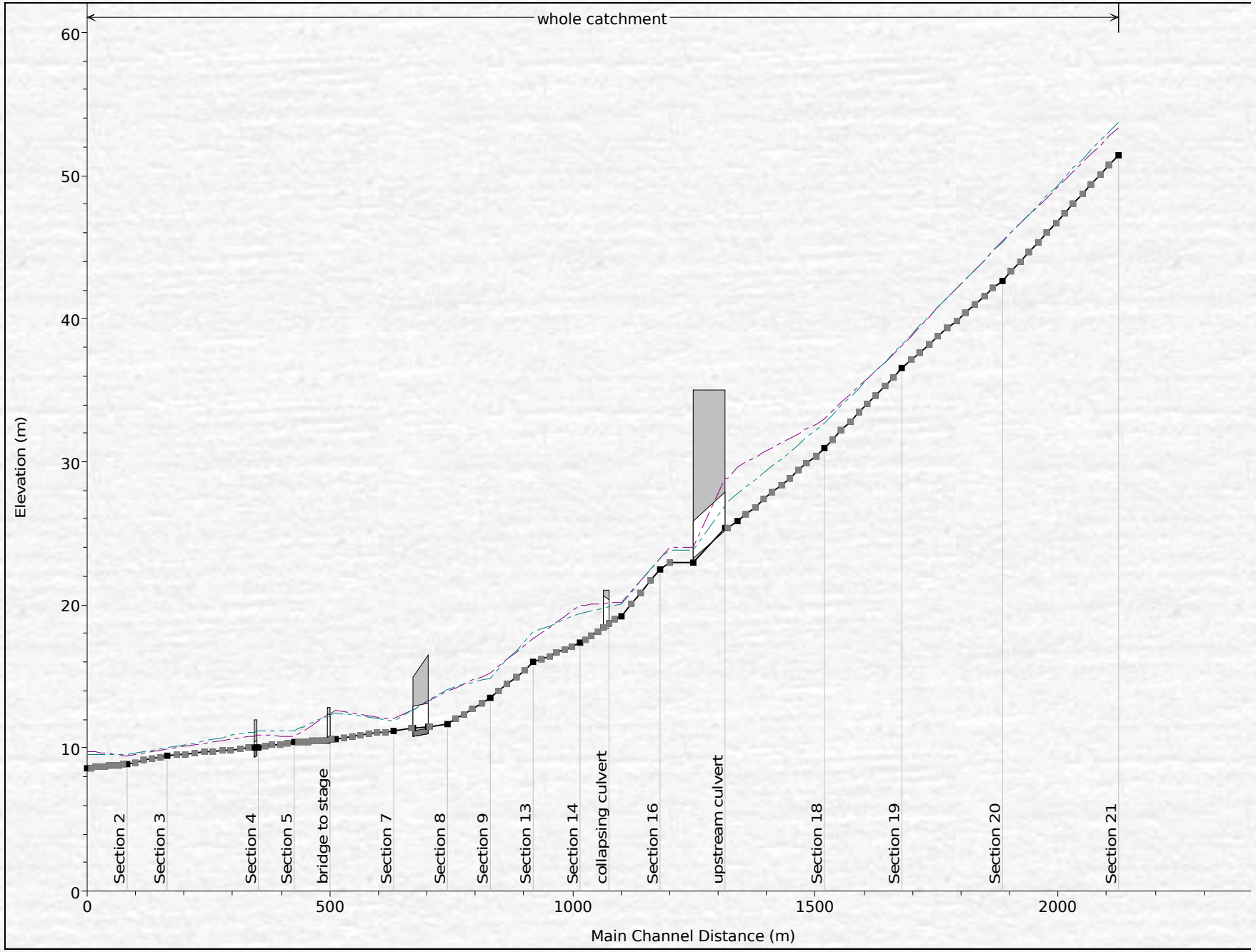
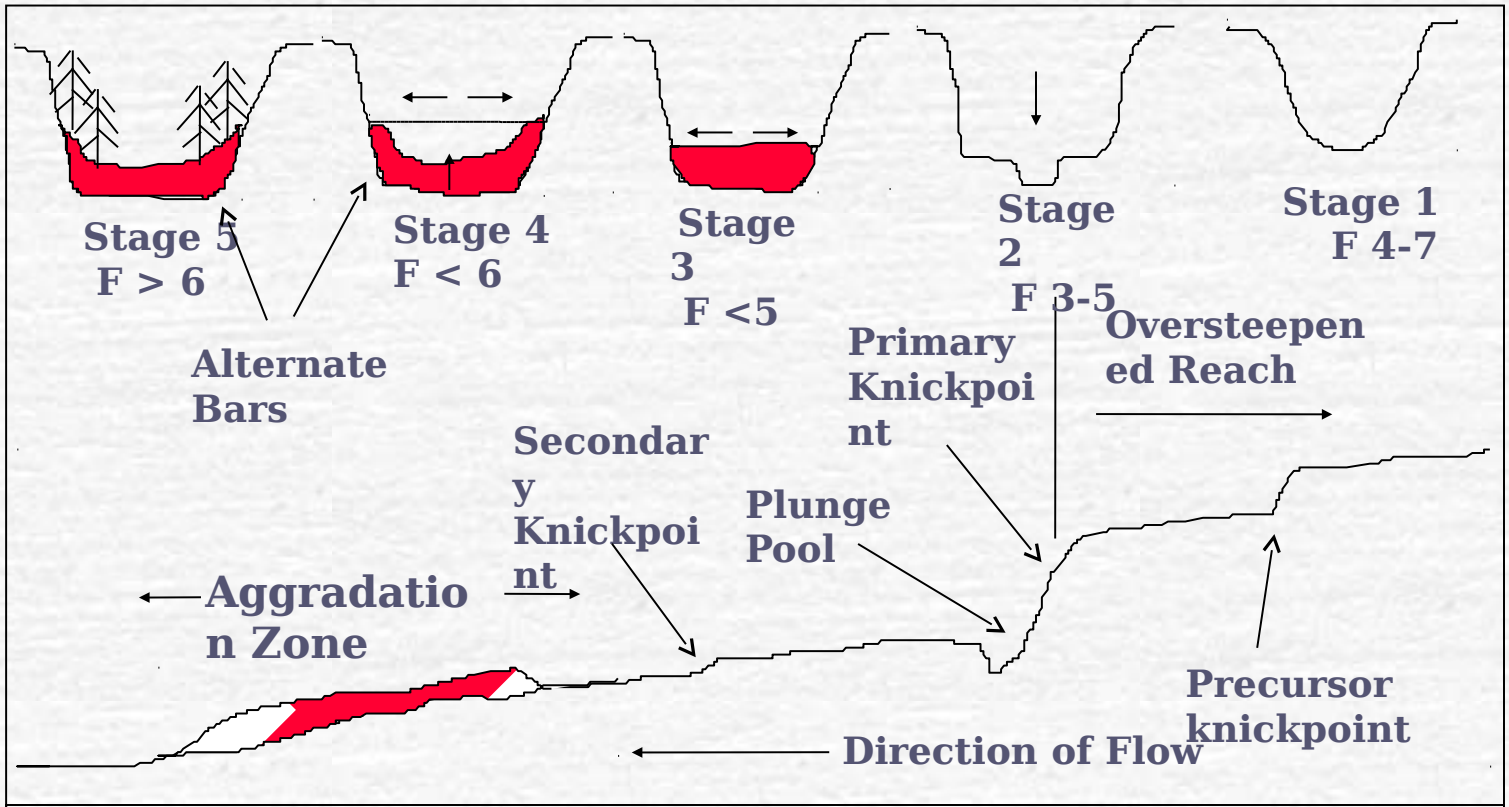
0 200 400 800 1,200 1,600
Feet

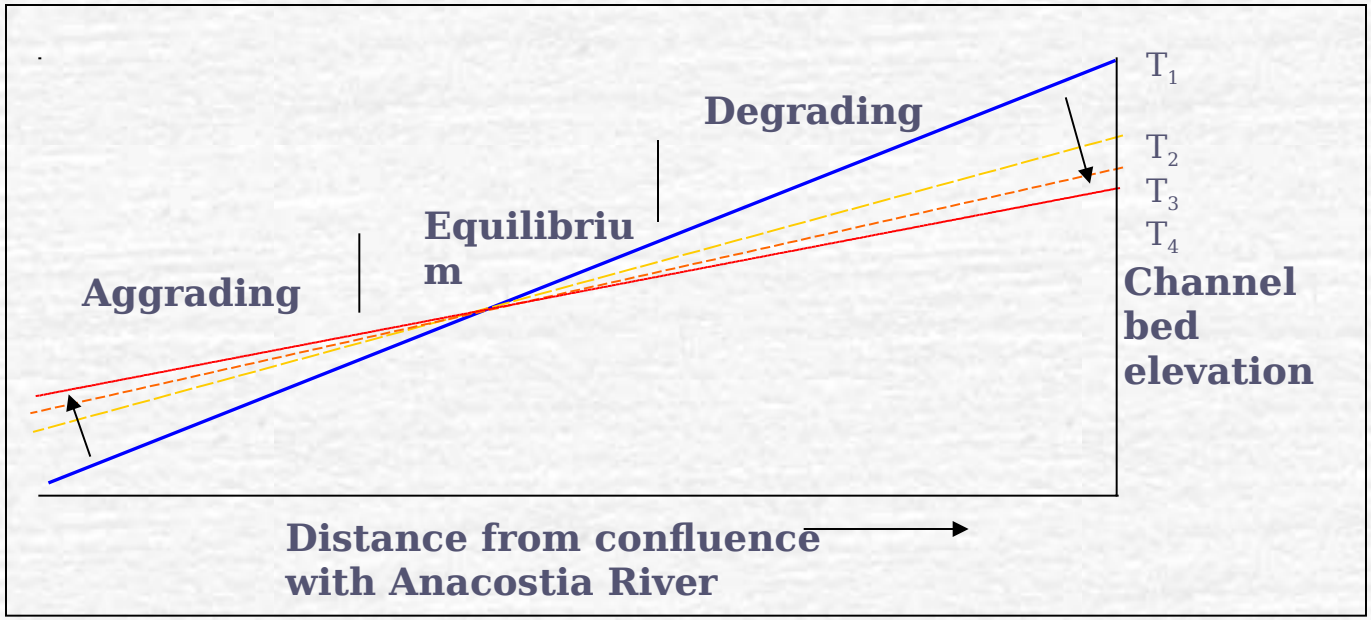
RSAT Stream Segment	Channel Stability	Channel Scouring/ Sediment Deposition	Physical Instream Habitat	Water Quality	Riparian Habitat Conditions	Biological Indicators	Overall RSAT Rating
POPE BRANCH							
Upper Mainsteam							
PB 1	Excellent (11)	NS	NS	NS	Good (5)	NS	**NS**
PB 2	Poor (2)	NS	NS	NS	Excellent (6)	NS	**NS**
Middle Mainstem							
PB 3	Good (7)	Fair (4)	Fair (3)	Fair (3)	Good (5)	Fair (4)	**Fair (27)**
Lower Mainstem							
PB 4	Good (5)	Fair (3)	Fair (3)	Poor (2)	Fair (3)	Fair (4)	**Fair (21)**
PB 5	Good (6)	Fair (4)	Fair (3)	Poor (2)	Fair (3)	Fair (3)	**Fair (21)**
FORT DUPONT							
Mainstem							
Upper	Good (6)	Fair (3)	Fair (3)	Fair (3)	Excellent (6)	Fair (4)	**Fair (25)**
Middle	Excellent (9)	Fair (4)	Fair (4)	Fair (4)	Good (5)	Fair (4)	**Good (30)**
Lower	Excellent (9)	Fair (3)	Fair (3)	Fair (4)	Good (4)	Fair (4)	**Fair (27)**
Tributaries							
No. 1	NS	NS	NS	NS	NS	NS	**NS**
No. 2	Excellent (10)	Good (5)	Good (5)	Fair (5)	Excellent (7)	Good (5)	**Good (36)**
No. 3	NS	NS	NS	NS	NS	NS	**NS**


Stormsewer ou
Streets
Streams
Subwatersheds
Buildings
Water
Topography meters
0 - 23
23 - 51
51 - 79
79 - 107
107 - 135
0
0.4 Miles


whole catchment
Elevation (m)
Main Channel Distance (m)
0
10
20
30
40
50
60
0
500
1000
1500
2000
Section 2
Section 3
Section 4
Section 5
bridge to stage
Section 7
Section 8
Section 9
Section 13
Section 14
collapsing culvert
Section 16
upstream culvert
Section 18
Section 19
Section 20
Section 21

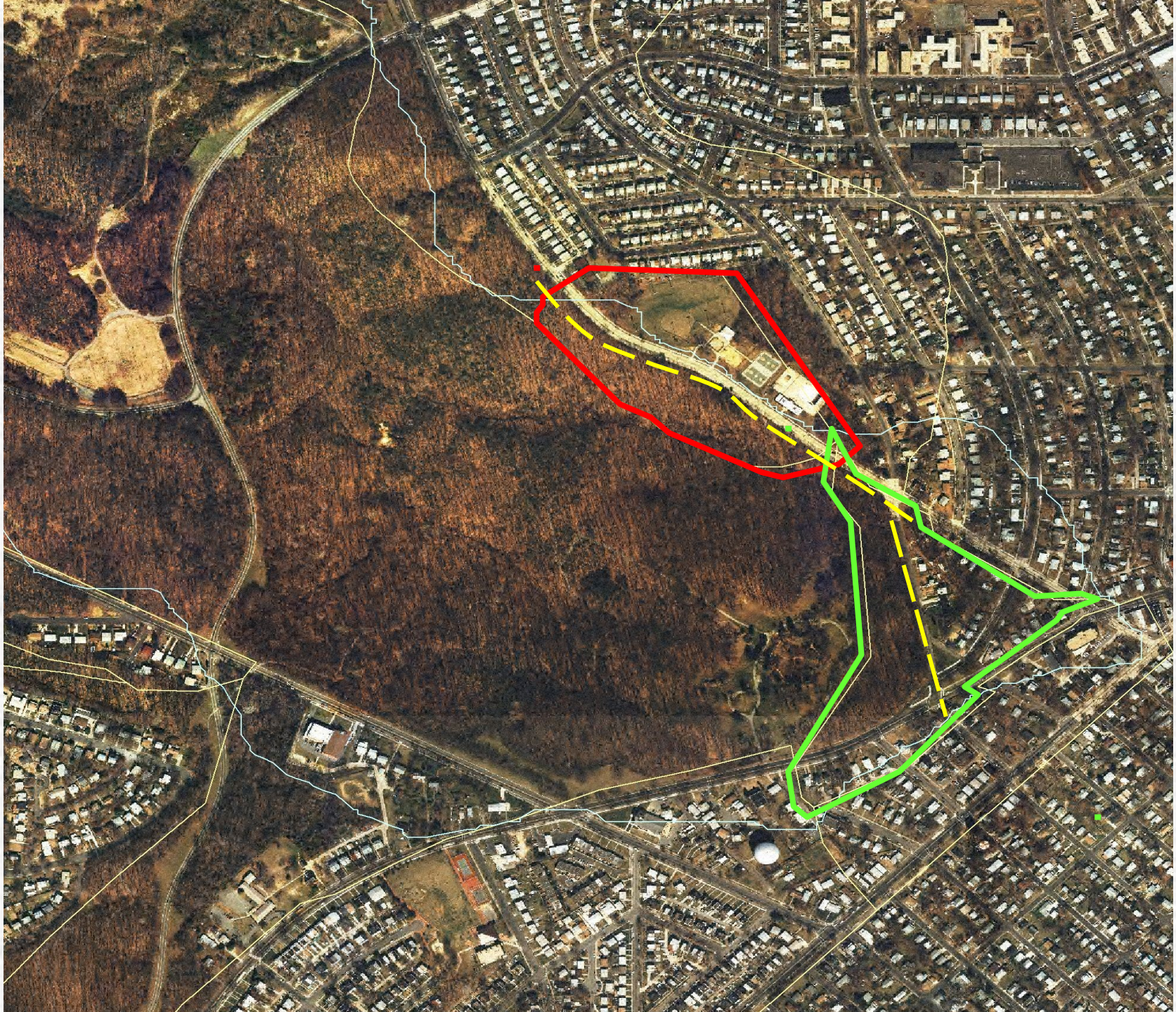


Schematic cross sections corresponding to reaches on the long profile show the evolution of the reaches from Stage 1 to Stage 5. Typical width-depth ratio (F) values are shown. Size of arrows indicate the relative importance and direction of dominant processes



T_x = equal time increments measured in years

Channel bed

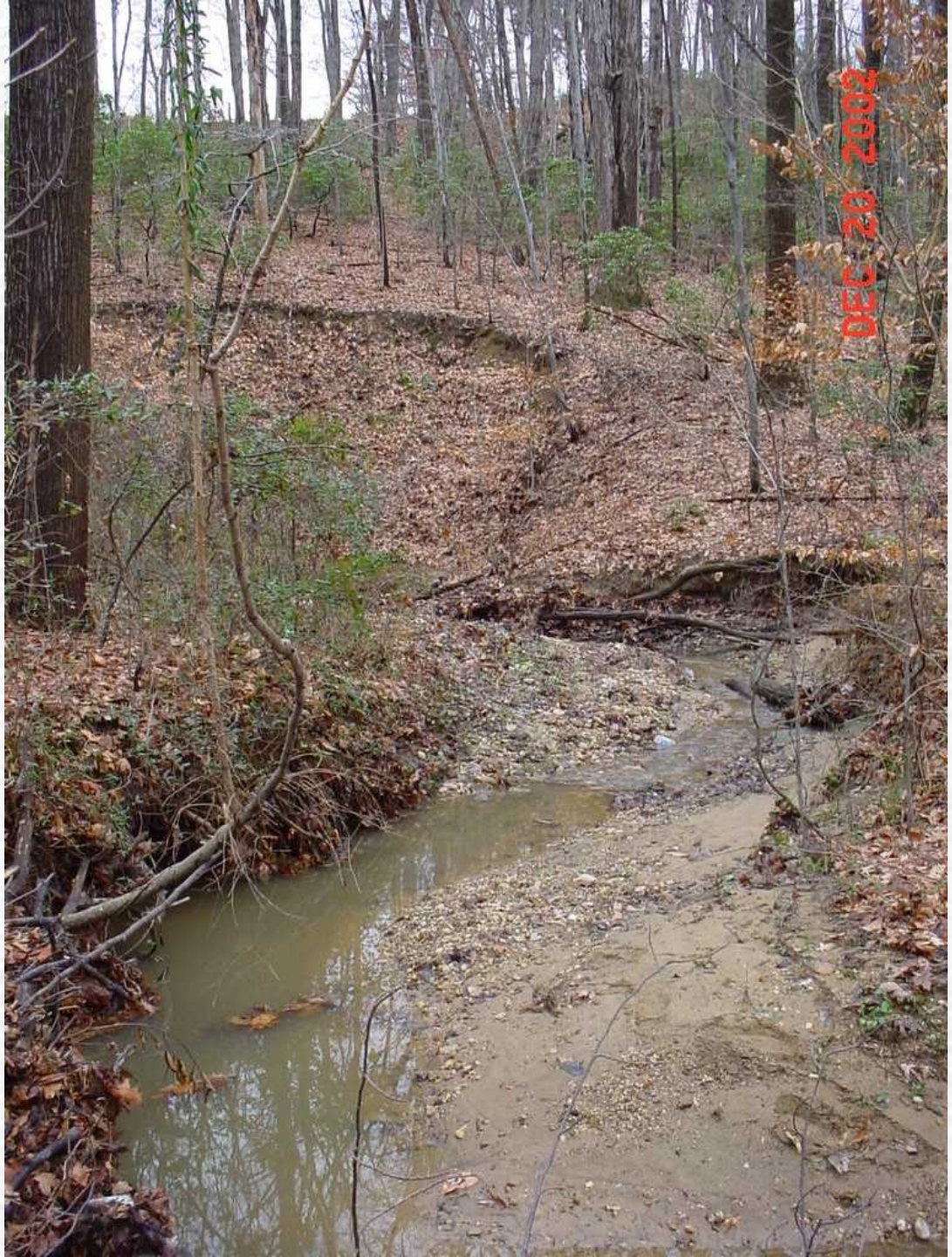


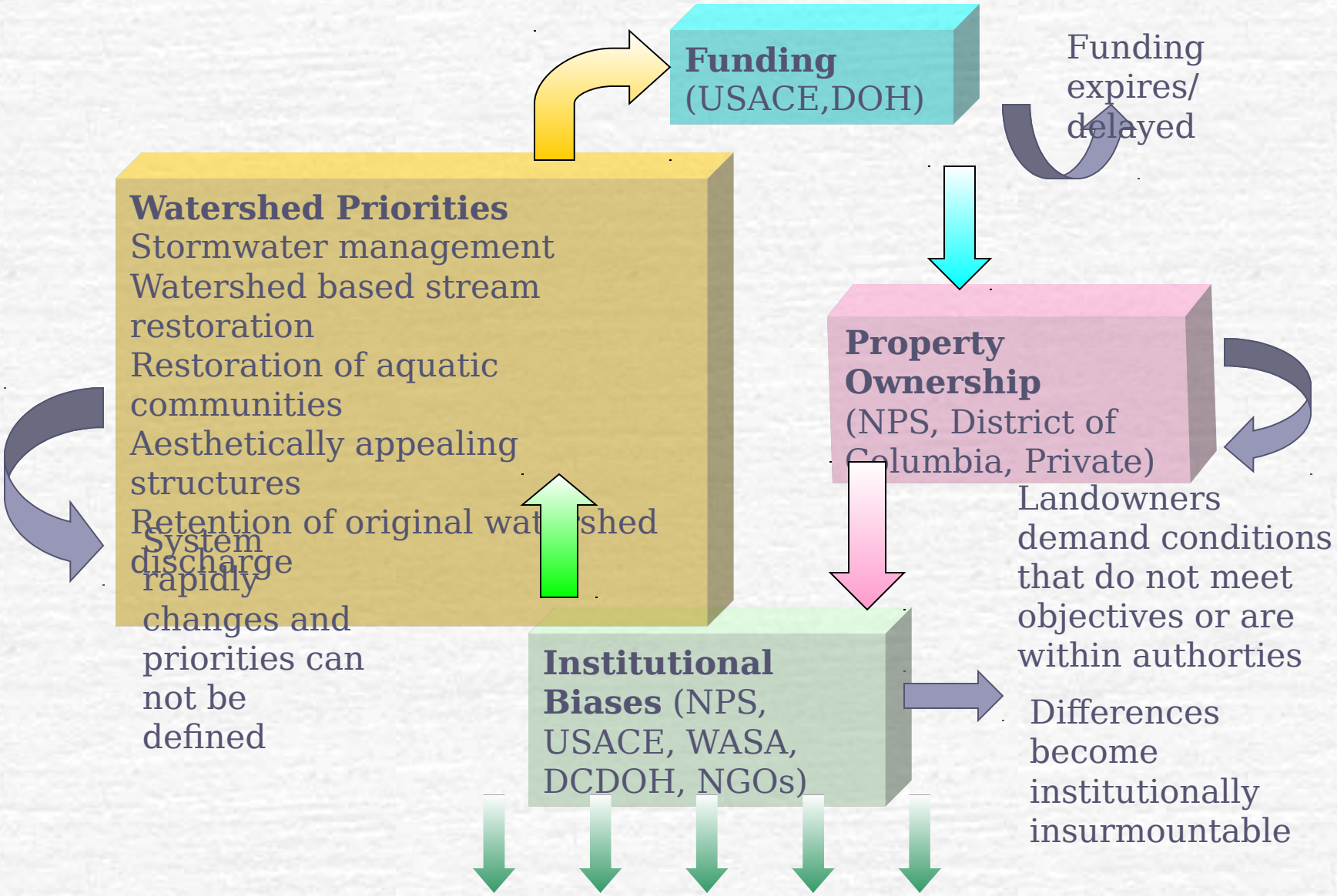
The stream has cut down to a marine clay layer in the upper section of the stream.

Figure 9. Upper Mainstem: Broken Concrete Storm Drain Outfall Apron (X-2 area)

Begin Pope

DEC


DEC 20 2002


Funding
(USACE,DOH)
Funding expires/ delayed
Watershed Priorities
Stormwater management
Watershed based stream restoration
Restoration of aquatic communities
Aesthetically appealing structures
Retention of original watershed discharge
System rapidly changes and priorities can not be defined
Property Ownership
(NPS, District of Columbia, Private)
Landowners demand conditions that do not meet objectives or are within authorties
Institutional Biases (NPS, USACE, WASA, DCDOH, NGOs)
Differences become institutionally insurmountable
Result achieved!!!

"The Partnership Cycle"

Restoration Objectives

- Improve in-stream aquatic habitat and riparian forest buffer
- Reduce sediment loads, nutrient and toxic runoff to Anacostia River
- Address stormwater running off of impervious surfaces

Ecological Targets

Fishes Collected in Oxen Run, 1920 [1]	Origin	Trophic Level	Suitable Values Flow (cfs) [2]	Adult Habitat	Spawning Strategy	Pollution Tolerance
1. American Brook Lamprey	Native	Herbivore	No preferred flow	All	Open Substratum	Intolerant
2. Blacknose Dace	Native	Generalist	0.1 – 5.97	All	Open Substratum	Tolerant
3. Northern Creek Chub	Native	Generalist	0.1 – 7.89	Pool/Run	Nest Builder	Tolerant
4. Fallfish	Native	Generalist	1.61 – 21.07	Pool/Run	Nest Builder	Tolerant
5. White sucker	Native	Omnivore	1.81 – 68.0	Pool/Run	Open Substratum	Tolerant
6. Northern Hogsucker	Native	Insectivore	1.99 – 36.8	Riffle/Run	Open Substratum	Intolerant
7. Creek Chubsucker	Native	Invertivore	Larger streams	Pool	Open Substratum	----------
8. Bluntnose Minnow	Native	Omnivore	0.1 – 39.8	Pool/Run	Nest Builder – Guarded	Tolerant
9. Rosyside Dace	Native	Insectivore	0.1 – 1.96	Pool	Open Substratum	Intolerant
10. Swallowtail Shiner	Native	Omnivore	0.269 – 68.0	Pool/Run	Crevice Spawner	Tolerant
11. Satinfin Shiner	Native	Omnivore	0.269 – 10.0	Pool/Run	Open Substratum	Tolerant
12. Common Shiner	Native	Omnivore	2.58 – 10.79	Pool/Run	Open Substratum	Intermediate
13. Steelcolor Shiner	Native	Insectivore	Larger streams	Run/Pool	Crevice Spawner	----------
14. Golden Shiner	Native	Omnivore	No preferred flow	Pool	Open Substratum	Tolerant
15. Eastern Silvery Minnow	Native	Herbivore	Larger streams	Pool/Run	Open Substratum	Tolerant
16. Silverjaw Minnow	Native	Insectivore	0.7 – 10.7	Pool/Run	Open Substratum	Intermediate
17. Cutlips Minnow	Native	Omnivore	0.1 – 68.0	Pool/Run	Nest Builder	Intermediate
18. American Eel	Native	Piscivore	10.01 – 68.0	Pool/Run	Ocean Spawner	Intermediate
19. Banded Killifish	Native	Invertivore	=3.6	Pool/Run	Open Substratum	Tolerant
20. Redbreast Sunfish	Native	Invertivore	No preferred flow	Pool	Nest Builder - Guarded	Tolerant
21. Pumpkinseed Sunfish	Native	Invertivore	No preferred flow	Pool	Nest Builder - Guarded	Tolerant
22. Largemouth Bass	Introduced	Piscivore	No preferred flow	Pool	Nest Builder – Guarded	Tolerant
23. Tessellated Darter	Native	Insectivore	0.1 – 68.0	Pool/Run	Nest Builder – Guarded	Tolerant

Recommended Plan

- Low impact development stormwater management techniques (curb cuts, bioretention areas)
- “Soft” engineering techniques such as geotextile sediment traps
- Low-flow channel to maintain baseflow
- Ecologically and Aesthetically pleasing freshwater tidal marsh at the mouth of the stream

Urban Watershed Restoration Process

- Stormwater retrofitting
  - DC DOH, DC WASA, NPS
- Pollution prevention
  - DC WASA, NPS
- Stream restoration
  - USACE

Lessons Learned

- Define “restoration” in each particular project and evaluate each stakeholder’s definition
- Encourage critical thinking that leads to recommendations
  - Stormwater management
  - Utilities
- Inclusion of all possible stakeholders can lead to inaction